NERRS Science Collaborative Progress Report for the Period 03/01/11 through 08/31/11
Submitted September 7, 2011

Project Title:

Sustaining Coastal Landscapes and Community Benefits:
Developing an Interdisciplinary Model for Enhancing the Impact of NERRS Science

Principal Investigator(s): Dr. Christine Feurt & Dr. Robert Johnston

Project Investigators Wells NERR Science Collaborative Team
Dr. Christine Feurt (Science Integrator), Dr. Michele Dionne, Tin Smith, Suzanne Kahn Eder, Jeremy Miller, Jake Aman, Sue Bickford, Annie Cox, Kathryn Rosengren

Titles:
Coastal Training Program Coordinator (CTP), Research Director, Stewardship Coordinator, Education Director, Research Associate, Research Associate, GIS Specialist, CTP Associate, TIDES Fellow

Project Research Team
This interdisciplinary team designs and conducts economics, ecological and communication research in collaboration with stakeholders.
Co-Principal Investigator Dr. Christine Feurt, CTP Coordinator, Wells NERR & Director Center for Sustainable Communities University of New England
Co-Principal Investigator: Dr. Robert Johnston, Director, George Perkins Marsh Institute and Professor, Department of Economics Clark University
Dr. Michele Dionne, Research Director, Wells NERR
Dr. Verna DeLauer, Research Scientist, George Perkins Marsh Institute, Clark University
Dr. Mahesh Ramachandran, Research Associate, George Perkins Marsh Institute, Clark University
Mr. Peter Wiley, Economist, NOAA Coastal Services Center

Project start date: Fall 2010

Report compiled by: Christine Feurt and Project Research Team
For additional information about this project contact Dr. Christine Feurt cfeurt@wellsnerr.org
Phone 207-646-1555 x 111.

Contributing team members and their role in the project:
See above for Wells NERR Science Collaborative Team and Project Research Team composition

Wells NERR Stakeholder Network These 18 organizations participated in the development of the proposal. Representatives from all members of the network interacted with the Wells NERR or Project Research Team during this reporting period to provide feedback on research design and incorporation of results in conservation, management and planning.

1. Maine Association of Conservation Commissions
2. Maine Geological Survey
3. Maine Coastal Program
4. Maine Nonpoint Education for Municipal Officials (NEMO)
5. Maine Sea Grant
6. Maine Drinking Water Program

7. Maine Department of Inland Fisheries and Wildlife, Beginning with Habitat
8. Maine Department of Environmental Protection
9. Maine Department of Marine Resources
10. Southern Maine Regional Planning Commission
11. Mt A to the Sea Conservation Initiative
12. Rachel Carson National Wildlife Refuge
13. University of New England
14. Laudholm Trust
15. Piscataqua Region Estuaries Partnership
16. Town of Wells, Planning Department
17. Town of Sanford, Planning Department
18. Town of Kennebunk, Conservation and Open Space Planning Committee & Planning Department

A. **Progress overview**:

Overall Goal of Project

The proposed project will develop and apply an integrated, spatially-explicit, transdisciplinary framework to characterize and quantify the impact of riparian management on ecosystem services identified as important by Wells NERR stakeholders including land use decision makers, planners and policymakers at state and municipal governmental scales and partner NGOs. Building on ecological models and data available for the Wells NERR, including data in the System Wide Monitoring Program, the project will coordinate economic expertise in ecosystem service valuation with Wells NERR expertise in ecological science to provide defensible estimates of social benefits associated with riparian area management in the Wells NERR region, as realized through changes in ecosystem services. Quantification of values and tradeoffs associated with management alternatives will provide information crucial for policy design and to identify often overlooked benefits of policies to enhance ecosystem sustainability. Integrated components of the proposed project will ensure that science-based results are applied effectively to inform coastal management and land use decisions and that the results are transferrable to other Reserves. Outputs will provide heretofore unavailable mechanisms through which NERRS ecological data can be integrated with economic data and used in coordination with stakeholders to inform coastal management that sustains ecosystem services.

Overall Project Objectives

I. Develop a user-inspired, transdisciplinary model to guide sustainable riparian management in the Wells NERR and surrounding watersheds, grounded in geo-spatially explicit quantification of ecological/economic tradeoffs in ecosystem services and values.

II. Coordinate social science and cognitive theory, principles of effective communication, local motivations for stewardship/conservation, and approaches for social learning to:
    a. Identify specific stakeholders most influential in affecting decisions, management and policy change affecting Wells NERR riparian areas addressed in Objective I.
    b. Evaluate Wells NERR communication approaches to these identified stakeholders/stakeholder groups to assess the degree to which messages are in alignment with values and priorities identified in Objective I;
    c. Develop high impact, science-based communication strategies and decision support tools—based on the ecological/economic results of Objective I—to inform integrated management of riparian area land use, habitat and nonpoint source pollution in watersheds draining into the Wells NERR region.

III. Engage Wells NERR stakeholders, the Science Collaborative Team and the Project Research Team within a collaborative learning process to build long-term institutional and regional capacity for improved riparian management through a community of practice. Collaborative learning will be grounded in coordinated science, communication and decision support outputs of Objectives I and II.

IV. Based on results of prior objectives, develop transferable templates for application of developed methods to guide policy development and stakeholder interactions in other Estuarine Reserves. Integrate with NERRS/NOAA to assist in broader adoption.

Focus of Objectives for the period March 2011 – September 2011

Project Timeline Highlighted for this Reporting Period

Objectives, Products, Activities	Year 1					Year 2					Year 3			
	Q1	Q2	Q3	Q4		Q1	Q2	Q3	Q4		Q1	Q3	Q3	Q4
Objective I: Develop Models Quantifying Ecosystem Services and Values	x	x	x	x										
Objective I: Develop, Test and Implement Choice Experiment; Conduct Ecological Field Campaigns; Finalize Model Linkages			x	x		x	x	x						
Objective I: Data Analysis and Results for Ecological/Economic Models								x	x		x			
Objective II: Communications Audit		x	x	x		x	x							
Objective II: Mental Models and Test Cases				x		x	x	x	x		x	x		
Objective III: Develop Community of Practice	x	x	x	x		x	x	x	x		x	x	x	x
Objective IV: Develop/Disseminate Decision Support Tools and Transfer Mechanisms											x	x	x	x
Objectives I-IV: Coordinate with Stakeholders	x	x	x	x		x	x	x	x		x	x	x	x

B. Working with Intended Users: Stakeholder/Researcher Engagement

Seamless integration of project participant's perspectives devolves from three key attributes of the Wells NERR: (1) the use of robust existing collaborative networks of partners whose needs, practices and priorities informed this project; (2) nearly a decade of experience developing locally accepted, practical, trusted collaborative learning approaches for community based ecosystem management; (3) staff with expertise in social and natural science disciplines to direct collaborative research to accomplish objectives and build capacity. Integration with stakeholders and opportunities for collaboration during this project period are summarized below.

Training events, meetings and workshops engaging members of the Wells NERR Science Collaborative Team, the Project Research Team and stakeholders responsible for riparian research, management, conservation, planning and education are listed below. These interactions provide opportunities for exchange of scientific information, sharing of management challenges, modeling best practices and strengthening of the stakeholder network linked to the project.

- Environmental Communication Courses: *Water Words that Work* and *More Than a Message* with Eric Eckl, August 2 & 3, 2011, 90 people
- *Landscaping at the Water's Edge*, March 30-31, 2011 29 people
- *Sustaining the Saco* Researcher and Stakeholder Workshop, April 27, 2011, 28 people.

- *Stormwater Management Manual for Coastal Communities* Workshop (2), May 18, 2011, 20 people.
- DEP Volunteer River Monitoring Program Training, June 3, 2011, 8 people.
- USFWS Dam and Natural Barriers Survey Training, June 7, 2011, 4 people.
- *Source Water Protection Watershed Management Hike*, June 28, 2011, 15 people.
- *Low Impact Development Techniques and Success Stories NH Coastal Watershed Tour* July 26, 2011, 30 people.
- Kennebunk Conservation and Open Space Committee Workshop, *Healthy Lawns, Healthy Waters* April 7, 20 people attended 3 hour workshop and broadcast to Cable Access is ongoing.
- *Sustaining the Saco- Stakeholder Engagement and Ecosystem Management.* Presentation to Maine EPSCoR Sustainability Solutions Initiative Workshop April 15, 2011. 70 people.
- *"The Salmon Falls Watershed Collaborative"* Presentation to the NH Drinking Water Source Protection Conference about the work of the Collaborative to find the right ingredients for success for this partnership that include an integration of science, practical experience, local knowledge and methods for building capacity to accomplish water quality goals. May 10, 2011.
- *"We're All in the Same Boat"* Stakeholder boat tours on the Salmon Falls River, Saco Estuary and Webhannet Estuary. Four trips July 25, August 3, 22 & 25. For researchers, managers, planners, land conservation professionals, TIDES graduate students, and other stakeholders to discuss diverse approaches to sustaining ecosystem services associated with riparian areas, estuaries and wetlands. 50 people.
- *Working Collaboratively to Maintain Ecosystem Services in Southern Maine*, a Natural Resource Providers Summit, June 21, 2011, 19 people, 5 hours each, 95 contact hours. <u>This meeting engages the Advisory Committee for the NERRS Science Collaborative project at the Wells NERR</u>. The Agenda and attendees to this key meeting are described below.

Participation by Wells NERR Science Collaborative Team Members in these Stakeholder Networks working on Riparian Management Issues:

- New Hampshire Climate Adaptation Workgroup. March 29, June 29, 2011.
- Southern Maine Partnership for Sustainability. March 18, May 20, June 16, 2011.
- *Ecosystem Health Indicators Conference* participation March 30-31, 2011. Boston, Mass.
- Salmon Falls Watershed Collaborative – Monthly conference calls
- Mousam & Kennebunk Rivers Alliance
- Saco River Corridor Commission
- Mt Agamenticus to the Sea Conservation Initiative
- University of New England Center for Sustainable Communities – Saco Estuary Project
- Citizen Action Coalition for the Piscataqua Region Estuaries Partnership

<u>Project Advisory Committee</u>

Agenda and attendees for Regional Natural Resources Provider's Summit appear below. This group represents the Advisory Committee for the project.

Regional Natural Resources Provider's Summit

Tuesday, June 21, 2011 10:30 am until 2:00 pm

Mount Agamenticus Lodge

A forum for discussion of shared priorities and challenges to conserving ecosystem services in southern Maine communities.

Notes prepared by Annie Cox: 6/21/11 Reviewed by attendees and finalized July 31,2011
Complete meeting minutes available from Annie Cox of Wells NERR acox@wellsnerr.org
Meeting Organized by Jodi Castallo, MtA2C Conservation Initiative
Facilitated by Jodi Castallo & Chris Feurt, Wells National Estuarine Research Reserve

Meeting Agenda

1. Round robin format for everyone to present current work and messages used to convey how your objectives benefit communities and the things people value.
    a. Chris Feurt, Wells Reserve will give an update and provide some information about the "Sustaining Coastal Landscapes and Community Benefits" project
    b. Key issues and projects each group is working on in Southern Maine and current messages used.

        Key issues will be especially important for Verna DeLauer to hear as part of her research for the Sustaining Coastal Landscapes and Community Benefits project she is conducting with the Wells NERR. Verna will explain how she will use the data and will be audio recording the meeting.
2. Working lunch presentation by Verna DeLauer
3. Mental Models activity – the Value of Riparian Buffers
4. Adjourn

In Attendance:
Jodi Castallo, Mt Agamenticus to the Sea Conservation Initiative, mta2c@gwrlt.org, 646-3504
Elizabeth Hertz, Maine State Planning Office, elizabeth.hertz@maine.gov, 207-624-6220
Donald Kale, Maine DEP, Donald.Kale@maine.gov
Andrew Tolman, Maine CDC Drinking Water Program, andrews.l.tolman@maine.gov, 207-287-6196
Erika Bonenfant, Maine CDC Drinking Water Program, Erika.bonenfant@maine.gov, 207-287-5681
Marcel Pollack, Maine Association of Conservation Commissions, marcel@meacc.net, 207-665-2577
Steve Walker, Maine Beginning with Habitat Program, Steve.Walker@maine.gov,207-287-5254
Verna DeLauer, Research Scientist, Clark University, vdelauer@clarku.edu,603-313-3558
Dolores Leonard, NERRS Science Collaborative, Dolores.Leonard@unh.edu,603-862-3685
Kalle Matso NERRS Science Collaborative, kalle.matso@unh.edu, 603-862-3508
Nick Sceggell, Granite State Rural Water Association, nsceggell@granitestatewater.org, 603-1603
Kristen Grant, Maine Sea Grant/University of Maine Cooperative Extension, kngrant@maine.edu, 207-646-1555x115
Jonathan Lockman, Southern Maine Regional Planning Commission, jlockman@smrpc.org, 207-324-2952 x13
Jackie Sartoris, Manomet Center, jsartoris@manomet.org, 207-721-9040x7
Donald Kale, Maine DEP, Donald.Kale@maine.gov
Chris Feurt, WNERR, cfeurt@wellsnerr.org, 207-646-1555x111
Annie Cox, WNERR, acox@wellsnerr.org
Kathryn Rosengren, WNERR /UNH TIDES Fellow, klm58@wildcats.unh.edu
Elle O'Brien, WNERR, NOAA Intern,eobrien3@washcoll.edu

C. Progress on project objectives for this reporting period:

(See stakeholder report in section B for Objective III)

Interdisciplinary Research Team Integration Meetings

Project research team conducted conference calls and meetings to coordinate interdisciplinary aspects of the project. Project Research Team met for 2 ecology workshops with Dr. Michele Dionne to develop economic and communication protocols that are coupled to ecological aspects of the project and to develop shared ecological knowledge to ground the research team in a common language and literature base.

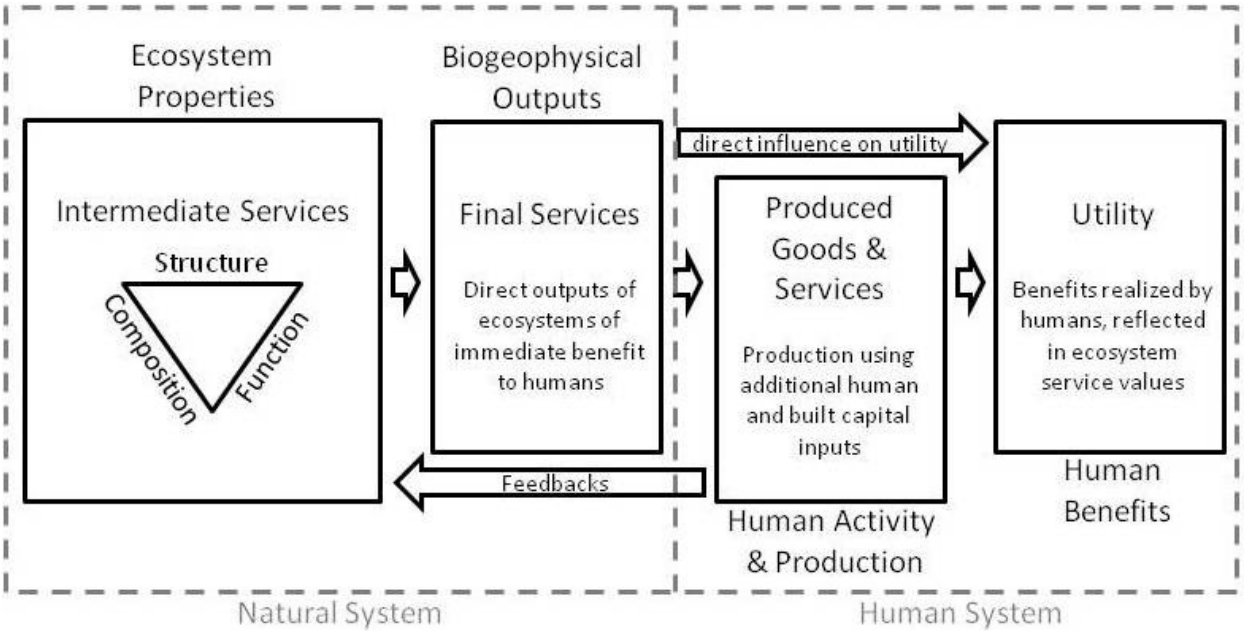
Objective I: Quantify Tradeoffs in Ecosystem Services & Associated Economic Values

Task I.1. Develop Ecological Scenarios and Characterize Biophysical Status, Trends and Responses

Ecological monitoring of Ecosystem Services from Streamside Habitats—riparian buffer function conducted March – August 2011 and is ongoing. Researchers sampled stream invertebrates, periphyton, water quality, fish, and fish habitat to measure the value of streamside vegetation for mitigating non-point source pollution (nitrogen) in the Merriland River/Branch Brook/Little River watershed. This information is necessary to characterize ecosystem services identified as important by Wells NERR stakeholders. During this period ecological research included assessment of nitrogen runoff from paired buffered and non-buffered riparian areas in Reserve watersheds. Sampling took place in twenty sites measured during spring and fall freshets and high summer. Resin bags were deployed for one month periods to catch nitrogen as runoff soaks into the soil surface. Samples were analyzed for nitrate and ammonia. Biological sampling of stream invertebrates, fish, epibenthic algae, and water quality parameters of temperature, dissolved oxygen and turbidity using data loggers were conducted at 6 of the paired sites. Biology was sampled in late summer. Water quality parameters was collected using two data loggers for 48-72 hour periods at each of the biological collection sites during resin bag deployment in spring, summer.

Task I.2. Characterize Linkages between Ecological Outcomes, Ecosystem Services and Values.

Work during year one involved development of the conceptual framework through which the economic and ecological data will be linked—first as a basis for the choice experiment surveys, and ultimately as the foundation for the values to be estimated. This conceptual model, based on an ecosystem services framework, is summarized by the two figures below.



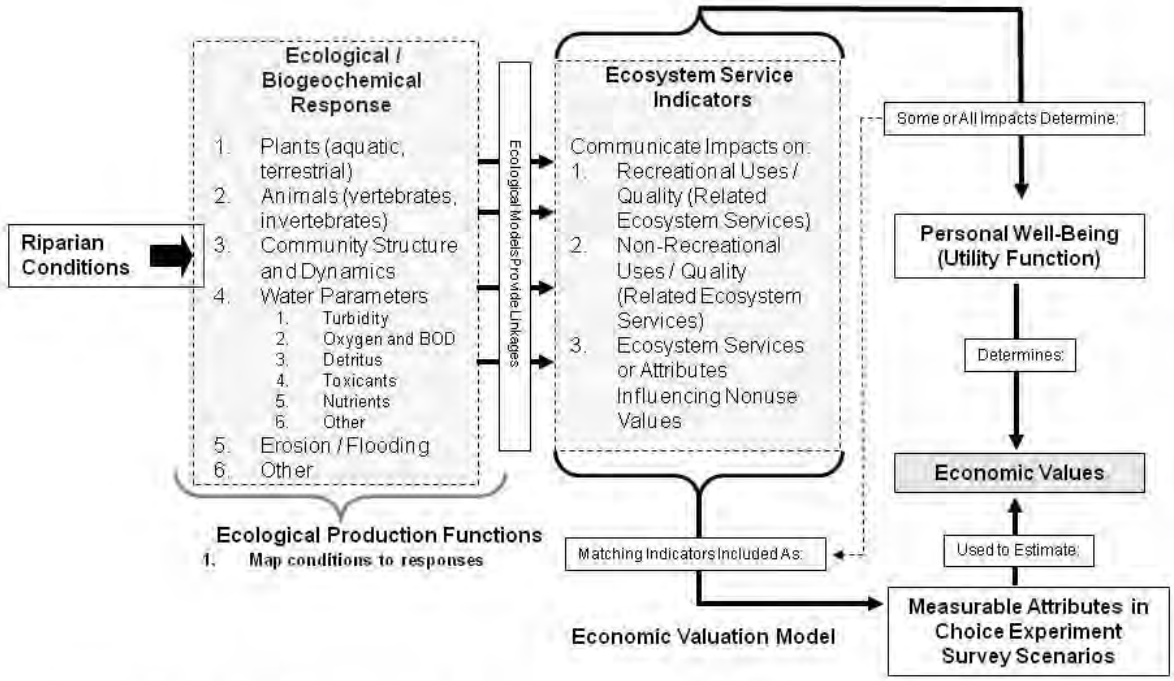


Figure 1. Conceptual Framework for Transdisciplinary Modeling of Ecosystem Service Values

Subsequent research activities have begun to link this framework to (1) specific ecological data available for the case study area, and (2) *potential* ecosystem service values. This work included a review of past work addressing ecosystem services related to riparian land management worldwide, and a visit of PI Johnston to a targeted workshop in Canberra, Australia related to the quantification and valuation of ecosystem services for watershed management (funded through other sources). The purpose of this review was to identify *potential* mechanisms (based on research elsewhere) through which changes in riparian land use/cover might influence ecosystem services and values in the case study area (i.e., the MBLR watershed in York County, ME). Simultaneous with this review, project researchers from Clark University (M. Ramachandran) have been working with Wells NERR ecological scientists (e.g., M. Dionne) to identify and catalogue existing data on ecological conditions and trends necessary to establish a baseline of ecosystem service delivery. These include GIS land use/cover data (including data on riparian land use/cover), data on water quality and trends, data on land use zoning and restrictions, and data on other ecological conditions and processes that are typically associated with ecosystem service provision (e.g., wildlife habitat). The result of this data collection will be a comprehensive catalog of data available as a foundation for the subsequent ecological/economic modeling (including development of choice experiment surveys).

The convergence of this economic and ecological research, combined with the results of upcoming focus groups, will provide the foundation upon which the proposed valuation choice experiments will be designed. Simultaneously, methods for focus groups have been designed and approved. Formal approval for focus groups was obtained from the Clark University IRB in March 2011. Based on the approved protocol, participant recruitment methods and consent forms were finalized and initial focus groups scheduled for September 2011. An initial script of focus group questions has also been finalized.

PI Johnston has also begun development of the methods through which the experimental design for choice surveys will be completed, once final attributes and levels have been determined. This has included consultations with colleagues specializing in experimental design and development of an initial framework for a design that minimizes D-error; currently the cutting-edge of design for choice experiments. The design will be finalized using NGene software (v 1.1) during subsequent project tasks.

Objective II: Evaluate Communication and Develop Communication Strategies

Objective II will evaluate Wells NERR and stakeholders' communication of science approaches to assess the degree to which messages align with: (1) values/priorities identified in Objective I and (2) methods of effective practice.

Task II.1. Develop and Implement Communications Audit:

The proposed audit will occur in three steps: 1) evaluate methods used by the Wells NERR and stakeholders to communicate and engage with state and municipal land use decision makers, planners, and others[1] regarding riparian systems and their management; 2) characterize related beliefs and misconceptions of these users resulting from specific communication messages/products.

Communication and Mental Models protocols developed by Dr. DeLauer and IRB prepared for submission and review by Clark University during this period.

Task II.2. Develop Mental Models and Test Cases

Objective III—Build Capacity for Management through a Community of Practice

This project uses the existing Wells NERR Stakeholder Network and their identified need for improved use of economic information on land use choices to guide the research process, adapt findings to practice and develop strategic communications. See section B above for description of work on this objective during this period.

Riparian Buffer Policy Analysis is of special interest to the Stakeholder Network and has been added to the project due to the availability of a TIDES graduate student intern for the period May to December 2011. Below is a summary of the work accomplished and on-going.

-Generated work plan and timeline for policy analysis work for the period May – December 2011.
-Followed and documented the progress or proposed legislation for the State of Maine that

[1] These include code enforcement officers, land developers, real estate professionals, public works directors, etc.

would impact shoreland zoning and/or riparian buffers
-Planned, generated and submitted UNH IRB application to seek approval for interviewing human subjects as part of project policy and enforcement analysis
-Generated resource spreadsheet compiling all policy regarding riparian buffers and shore land ordinances within the MBLR watershed
-Received video recording and editing training for documenting and sharing project progress on the NERRS Science Collaborative's blog

Tasks below were started during this reporting period and are on-going:

-Prepare blogs for the NERRS Science Collaborative and NERRS to provide greater access to the project, as well as for documenting methods, obstacles and adaptations to the project and promoting a general awareness about the reserves and their science collaborative funded projects
-Participating in weekly conference call discussions with fellow TIDES interns sharing about our projects as well as discussing progress and challenges
-Utilizing PREP's database and methodology (used for their planning assessment and report) to track/organize data and generate indicators regarding the towns' policies and planning (within the study)
-Conducting and managing marketing and recruitment for the project's fall focus groups
-Evaluating social network analysis program UCINET to map local natural resource outreach leaders' impacts on stakeholders and identify potential gaps

Objective IV. Develop Decision Support Tools and Methods for Transfer

This objective will provide environmental economists, interdisciplinary teams and social scientists interested in improving the impact of NERRS programs and science with templates and tools to predict and communicate the provision and value of ecosystem services and to use associated information to inform policy. Members from this group may differ from the Wells NERR stakeholders who developed this proposal. Academia and government scientists are the most likely beneficiaries of this methodology and will be engaged as a separate stakeholder group.

Initial stages of the project have been closely integrated with a variety of end user groups (see Wells NERR Stakeholder Network pages 1 – 2). Related activities have included multiple meetings involving the project PIs with potential users of project results. The goals of these interactions have been to establish specific mechanisms through which various groups might use and benefit from the provided information. The resulting insight will be used to (1) help develop research methods to provide information of maximum utility to managers and stakeholders, and (2) ultimately develop decision support and transfer tools to directly meet these needs.

During the next reporting period
Conduct Focus Groups
Analyze and synthesize data from focus groups
Develop and Present NERRS Webinar on Ecological Economics 101
Complete ecological sampling of riparian areas
Analyze and synthesize ecological date from year 1
Convene Research Team meetings and conference calls to begin to integrate ecological, economic and communications results for model development

Conduct interviews of scientists, Wells NERR staff and key stakeholders to develop mental models of ecosystem services.
Convene 1 year anniversary Stakeholder/Researcher Workshop

D. Benefit to NERRS and NOAA: List any project-related products, accomplishments, or discoveries that may be of interest to scientists or managers working on similar issues, your peers in the NERRS, or to NOAA. These may include, but are not limited to, workshops, trainings, or webinars; expert speakers; new publications; and new partnerships or key findings related to collaboration or applied science.

Drs. Johnston and Feurt engaged with NERRS Science Collaborative to plan and develop Ecological Economics 101 webinar for the NERRS system and NOAA.

TIDES Intern Kathryn Rosengren received video recording and editing training for documenting and sharing project progress on the NERRS Science Collaborative's blog.

Dr Johnston organized a seminar for the Project Research Team, select members of the Stakeholder Network and members of the NERRS Science Collaborative community. This seminar is described below:

"Economics of Improving Water Quality into the Great Barrier Reef"

Dr John Rolf of Central Queensland University in Australia, and is one of the world's most accomplished experts in the application of choice experiments and other economic analyses to river and riparian systems. Dr Rolf conducted a seminar for the researchers and stakeholders at the George Perkins Marsh Institute on July 13, 2011. Dr Rolf presented his research on river/riparian related choice experiments and work with direct relevance to this project. Kathryn Rosengren, the TIDES graduate fellow working on the project created a video of the presentation. Contact Kathryn at klm58@wildcats.unh.edu for more information.

Dr John Rolfe's bio and links to his relevant work can be found at http://cem.cqu.edu.au/FCWViewer/staff.do?sid=ROLFEJ, and http://resourceeconomics.cqu.edu.au/FCWViewer/view.do?site=102.

E. Describe any activities, products, accomplishments, or obstacles not addressed in other sections of this report that you feel are important for the Science Collaborative to know.
All results are described in the report.